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(When filled in)

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Support Project Initiation Memorandum (for Non-Scheduled Intelligence Production)	Type B	Control Number EA

TO: Production Control Staff.

2. Title or Subject (31)
Line 1 CIA Contribution to a Depart-
Line 2 ment of Commerce Study into
Line 3 the Effectiveness of the Ex-
Line 4 port Control Compliance
Line 5 Program

3. Analyst(s) & Other Contributors (31)
Line 1 C Contri- [redacted]
Line 2 bution from /

Manhours: 20

Completion Date (y m d) 1976 Feb 04

4. Requester and Purpose (39)
Line 1 The Honorable Elliot Richardson,
Line 2 Secretary of Commerce via Rauer Meyer,
Line 3 Director of Export Administration,
Line 4
Line 5 Bureau of East-West Trade
Line 6

P

Classification (39)
SECRET,

[redacted]

5. Precis (39)
Line 1 A study to determine the adequacy of
Line 2 the current compliance program to
Line 3 support established licensing policy.
Line 4 An examination is made of the current
Line 5 administrative apparatus and its effec-
Line 6 tiveness. Recommendations for any
Line 7 needed changes in policy and/or admini-
Line 8 strative procedures are to be made.

APPROVAL:

Branch (if less than 10 manhours) (Acting Chief) Date 2/3/76

Division (if 10 manhours or greater) Date

Director (to Date

Note: Numbers in parentheses indicate the maximum number of characters and blanks to be inserted in a line—i.e., (16) means no more than 16 spaces.

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D. Current Administrative Apparatus: Organization and Resources

2. CIA

a. Intelligence Collection and Dissemination

CIA and other members of the intelligence community have been tasked with reporting acquisitions of Western technology and equipment by the Communist countries. This task is currently formalized under so-called Key Intelligence Question (KIQ) guidelines. Reporting on illegal diversions is a part of the set of requirements levied in connection with the KIQs relating to the acquisition of Western technology and equipment by the Communists.

The results of CIA's efforts to collect intelligence on illegal acquisitions have been mixed. In general there has not been much reporting because of insufficient access to useful sources. Moreover, reporting on diversions is often a byproduct of reporting on other topics -- a hit or miss operation. Nonetheless there are enough reports of illegal acquisitions to make the collection

CIA information on diversions is disseminated to the departments of Commerce, Defense a

E. Effectiveness of US Compliance Program/Apparatus

5. Communist progress in overcoming technical deficiencies in selected strategic commodity sectors

USSR and Eastern Europe

The USSR and Eastern Europe is treated together in assessing the progress made in overcoming deficiencies in strategic equipment and technology sectors. Strategic equipment and technology going to any East European country is assumed to be available to the USSR. Many items obtained legally or illegally by Eastern European countries have been passed on to the USSR. Most sophisticated weapons systems in Eastern Europe are Soviet designed. It is uncertain to what degree the USSR shares advanced technology with Eastern Europe, but since the latter employ Soviet produced sophisticated weapons systems, Soviet technical deficiencies and progress in strategic items are applicable to Eastern Europe.

a. General Military

For many years a major goal of the Soviets has been to overtake and surpass the technologically advanced countries of the world in numerous areas of technology which they consider important. Toward this

objective, they have emphasized the acquisition of Western scientific and technical data as a means of keeping abreast of significant Western advances and making judgments as to their potential utility. In areas where urgent priorities have prevailed and where rapid progress has been desired, the Soviets have been consistently aggressive in attempting to exploit Western technologies to overcome their deficiencies. This process has commonly involved various levels of the Soviet party-government apparatus. The Soviets have developed many sources for acquiring Western technology and procedures designed for exploiting it. In the past, they have normally focused on scientific and technical disciplines for the purpose of advancing the state-of-the-art and solving urgent problems. Frequently these disciplines have been applicable in industries associated with military product developments.

Despite continued exploitation of Western technology and despite unprecedented investments in scientific and technical education and in research and development, however, the Soviets still lag the United States, Western Europe, and Japan in most areas of applied technology. The greatest deficiency is in the translation of new technology into production. This

deficiency is less acute in the military sector of the economy than in the civilian sector because much higher priority for limited resources and skilled manpower has consistently been granted to the military sector. Also, despite this deficiency, the Soviets have been able to design their weapons to accommodate the levels of technology and manufacturing capability available in the USSR at the time. In this manner they have been able to develop, manufacture, and deploy a formidable array of effective, though less advanced technologically, tactical and strategic weapons.

Most Soviet military systems are the result of indigenous design and manufacture. Only in infrequent cases are Soviet systems outright copies of Western ones. Rather than having items manufactured in the West in their military systems, the Soviets appear to emphasize the acquisition and mastering of Western technology to overcome their deficiencies and stimulate further advances.

The recent emphasis on quality in weapons rather than on numbers has increased the importance of sophisticated technology. An important option for the Soviets in seeking strategic parity or a marginal advantage, for example, would be to overcome weaknesses in such areas as command control, navigation, guidance,

and geodesy and gravimetry. The Soviets still have considerable incentive, therefore, despite their present strong military posture, to acquire important military technology from abroad.

The Intelligence Community believes that the USSR is interested in upgrading its technology in semiconductors, computers, machine tools and air traffic control and these areas are highlighted in this study. Although other areas also are important, those selected provide the Soviets with many of their critical needs and have been associated with Soviet illegal acquisition efforts.

b. Semiconductors

The Soviet semiconductor industry was based largely on indigenous resources until the mid-1960s. The Soviets were able to develop and produce conventional types of general-purpose semiconductors, transistors, and diodes, based on germanium, mostly without help from the West. After the mid-1960s, the USSR also began to produce conventional devices based on silicon, again mostly through their own efforts.

The Soviet semiconductor industry seriously lags that of many Western countries. Soviet integrated circuit (IC) production technology is 5 to 10 years behind US practice. Quality control procedures and

standards and protection against contamination during crucial processing steps are poor or nonexistent, and the technology for large-scale production of the materials used in manufacturing IC devices appears inadequate. The Soviet defense establishment seems to control the production of practically all ICs. Most of the limited number available are believed to go into military and space equipment, but thus far only on a selective basis -- no new generation of Soviet military electronics equipment based exclusively on ICs has been identified.

Soviet efforts to acquire IC manufacturing technology in the United States and in third countries have been extensive since 1970. Efforts to get machinery have been remarkably successful; the Soviets have purchased at least some key items of equipment for almost every major semiconductor manufacturing process. Replication of Western ICs and solid state technology is also being attempted in the USSR, although the Soviets still have not mastered the comprehensive manufacturing know-how.

Western IC production technology obtained by the Soviets will likely begin to benefit the Soviet military within a relatively short time. Most of the currently available ICs probably are being used in the

development of prototype electronic systems for military and space use. The acquisition and mastery of US IC production technology probably will accelerate Soviet military developments where higher reliability, lower weight, smaller volume, or lower power requirements are important. In the United States, ICs have found widespread applications in strategic missiles, space communications and reconnaissance, ASW detection systems, cryptographic systems, and virtually all types of computers.

Substantial improvement in Soviet IC output in the future depends heavily on the continued acquisition of Western production technology. Unless there are substantial relaxations in the embargo of this technology, however, Soviet success will be limited and the development of their advanced semiconductor industry will remain slow. Under these circumstances, the Soviets will continue their attempts to copy Western developments on their own, thus reducing R&D costs and permitting more rapid progress than otherwise possible -- a gain the West appears unable to forestall. Dependence on this strategy, however, will tend to keep the Soviets behind the West in IC technology as long as the West continues to advance.

c. Computers

The USSR designed, developed, and produced computers -- first and second generation scientific types -- largely with indigenous resources until 1970. The computer industry is seriously deficient in general, principally because of problems in producing high-quality ICs and other solid state devices. In the general purpose (GP) computer area, deficiencies are apparent in all aspects of hardware fabrication as well as in the maintenance, software, training support, and documentation for such computers. The most prevalent Soviet GP computers are based on discrete transistor technology and have performance characteristics similar to small- and medium-scale models manufactured in the West before 1964. Minicomputers have been neglected until recently. As in other industrial sectors, the translation of R&D efforts into high quality, high quantity production is a particular problem.

Further substantial progress in important military applications which rely heavily on GP computers, such as command and control and possible ABM defense, requires computer technology probably beyond Soviet capability in the near future, but now within the capability of the West. Some evidence indicates that

the Soviets have developed several models of special purpose (SP) computers for military applications, such as for aircraft, missiles, and spacecraft, but that these appear comparable with much earlier Western types. Digital computers on the new Soviet ICBMs, for example, are believed to be at the same technology level as those used in the US Minuteman I and Titan II. To date, the Soviets have generally employed less sophisticated designs for their weapons, thus requiring much less powerful SP computers than the US, and in some cases have been forced to rely on excessive redundancy to achieve acceptable levels of reliability.

Illegal acquisitions of computer hardware and software have played an important role in the development of Soviet bloc third generation data processing computers. The Soviet RYAD family of computers is a direct copy of IBM series 360-computers. Although the evidence is not conclusive, it seems likely that the USSR acquired IBM 360 computer systems, design information, and technical documentation long before sales of this system were authorized to Communist countries. We believe that access to the physical hardware and design information may have been crucial to the development of RYAD. However, the Soviets are producing RYADs largely through their own resources.

Recent improvements in RYAD capabilities, moreover, such as the addition of magnetic disc storage devices, have resulted from the exploitation of unauthorized acquisitions in the West. For example, magnetic disc drives are being manufactured by Bulgaria for the RYAD program. Most of the magnetic recording heads for drives manufactured during the past 3 years and for those currently being manufactured were acquired illegally. The drives themselves are copies of the IBM design.

The Soviets probably will continue to acquire various Western commercial computers and examine these for clues to improve their own designs. By and large, however, they will be forced to rely on proven component and circuit technology of the lowest practical level of sophistication for their weapons systems. Although the USSR cannot be prevented from developing computer production capabilities to satisfy their most important military objectives, embargo of critical Western technology -- particularly production equipment and know how -- can retard this development and make it more expensive. The cumulative effect of various transfers of computer technology to the Soviet Union will give the Soviets the potential to improve development and production capabilities over the long term and thus to make strategic gains.

d. Machine Tools

For years, the USSR has been the world's largest producer of general purpose machine tools (lathes, milling machines, drilling machines, etc.). These are designed and produced mostly with indigenous resources. Because the USSR produces so many general-purpose tools, however, it has neglected the development of specialized machine tools tailored to the very specific needs of industrial users. Thus, the Soviets were forced to acquire gear cutting and high-speed transfer machines from the US for their new passenger car plant at Tol'yatti. Although the Soviets have copied these types of US machines, they still prefer those built in the US because of their higher productivity and reliability.

Development of more sophisticated machine tool technology has been a major problem for the USSR. Specifically, the Soviets have been hard pressed to produce numerically controlled (NC) machines capable of operating in more than two axes simultaneously and machining centers capable of multiaxis control.

Because of these problems, Soviet advances in these areas are tied closely to the acquisition of Western technology. Unlike other areas of embargoed technology, the Soviets have been able to acquire advanced

Western machines through direct purchases authorized by COCOM. For example, the Soviets acquired a large number of machining centers from VETTI in 1973, including 3 and 4 axis NC machines. They also have acquired a large number of machining centers without COCOM approval. Our information indicates that at least some of these centers contained controllers with 5 axis capability.

We believe that future Soviet progress in producing machining centers and multiaxis NC machine tools will depend upon acquisition of Western production know-how and design technology. The Soviets have already concluded agreements with several Western firms in the area of NC machine tool technology, details of which have not been disclosed.

e. Air Traffic Control

The Soviet Union's national air defense system is seriously deficient against low altitude penetrating aircraft and cruise missiles. Reduced radar line-of-sight visibility at low altitudes requires complex radar networks capable of extensive, rapid, and accurate transfers of data. Present Soviet capability suffers from the manual nature of the ground controlled intercept system and the limited capabilities of the intercept radars.

The Soviets have expressed interest in two types of US air traffic control (ATC) systems, as well as several available from other countries. Many of the functions of these systems resemble those performed within an air defense network.

Several sophisticated technologies in US ATC systems not evident in the USSR's air defense network enable the US systems to outperform the Soviet systems. These technologies are associated primarily with on-line digital processing -- including real-time visual displays, real-time data processing, and software support for auto-detect and auto-track radars -- and multiple radar netting.

The Soviets conceivably could employ Western ATC systems to achieve improved air defense coverage down to 500-foot altitudes, but to do so would require a tremendous commitment of resources and would be virtually impossible to conceal. Between $1.5 and $3.5 billion would be required just to purchase enough displays and computers to provide a minimal 50nm radar coverage around the Western USSR. Annual maintenance and support requirements could also cost the Soviets the equivalent of several billion dollars per year.

Although a long-term effort would be required, the Soviets are attempting to exploit for their national or regional command and control systems some of the advanced technologies in portions of Western ATC systems they have acquired illegally, thereby achieving some improvement in capabilities. Perhaps the greatest potential military benefit from Western ATC systems would be the acquisition of equipment which would demonstrate the organization and operational techniques of automated command and control systems. With such equipment, the Soviets could automate in this and other areas. Extensive hands-on training probably would be introduced, resulting in a cadre of technicians for modern, automated, command and control programs.

PRC

Information is much more limited on the Peoples Republic of China, but its progress obviously lags that of the USSR and Eastern Europe. Although indigenous technological programs have had considerable impact at the local level, for the most part they have been far outweighed by foreign technology in fostering China's limited technological advances. Their indigenous efforts have been most successful in China's nuclear

weapons programs. The Chinese also have been very clever at upgrading acquired foreign technologies. Despite these limited indigenous successes, China would have been hard pressed to develop its own semi-conductors and computers without foreign assistance.

Acquisitions of technology from the West -- both legal and illegal -- have played a major role in China's advances, particularly in light of the Soviet withdrawal in 1960. The technologies have been most evident in those central industries bearing directly on China's advanced weapons programs. The most significant contributions to China's technological advancements in the strategic sector have come from purchases of electronic components and equipment, instrumentation, and computers. Adaptation of this equipment and reverse engineering have enabled China to overcome major technological problems which otherwise would have taken years to accomplish. Direct technology purchases for use in advanced weapons design or production have been relatively limited, the Spey engine being the most significant exception.

Although significant progress is being made in all sectors of China's military related industries, major technological gaps remain, and the Chinese give no evidence of rapid progress in closing them. Consequently, China continues to lag considerably behind the West in aircraft, missiles, nuclear land armaments, naval shipbuilding, and military electronics.